

2 - Learning Science: Cognitive, Affective, and Social Aspects | Empirical

SP - (15097) - STUDENT-GENERATED ANALOGIES IN CONSTRUCTING EXPLANATIONS FOR CHANGES OF THE STATES OF MATTER

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Short Abstract

Analogies are a useful cognitive tool in science education. In addition to teacher-centred analogies that teachers generate and introduce analogies in their teaching, student-centred analogies that students generate them to foster their conceptual understanding are also emphasized. Spontaneous analogies that students generate their own analogies in explaining without teachers' instructions were examined in this study. The subjects were 106 seventh-grade students and 98 eighth-grade students who belonged to in one lower secondary school, and 172 tenth-grade students at three upper secondary schools in Japan. Two-steps survey was implemented. In the first step, all students completed a questionnaire on the temperature change of ice melting. After selecting the subjects of the second survey based on students' responses, 4 seventh-grade, 4 eighth grade, and 40 tenth-grade students were interviewed to determine their levels of understandings. The top three focuses of their explanations were identified; ice melting as the cause of temperature stability, ice preventing the temperature of water from rising, and the time it takes for the temperature to change. In all, 40% of the interviewed students used analogies when they explained their reasoning in the dialogue situation and the dissolving their knowledge gaps. Almost all of the analogies were generated from near-distance domains which are close to changes of states of matter as target domain. Analogies based on far-distance domains were personifications and human-related. The students' spontaneous analogies in their explanations were involved the generalization of the targeted situation and phenomena, the dissolution of students' cognitive conflict, and the simplification and extension of the properties of natural phenomena. Not all spontaneous analogies contributed to enhancing to understanding phenomena. The study suggests that the spontaneous analogies aid students in expressing their understanding more easily for formative assessment. It is recommended that teachers urge students pay attention to evaluating their analogies critically.